PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	10/772,699
Filing Date:	February 5, 2004
Applicant:	Leroy M. Edwards et al.
Group Art Unit:	1795
Examiner:	Keith D. Walker
Title:	PASSIVE HYDROGEN VENT FOR A FUEL CELL
Attorney Docket:	8540G-000156 (GP-302738)

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Appeal Brief Under 37 C.F.R. § 41.37

Sir:

This is an appeal from the final Office Action mailed March 23, 2010. A Reply After Final were filed on April 19, 2010; an Advisory Action was mailed April 26, 2010. Appellants filed a Notice of Appeal on April 29, 2010. This Brief is due, without extension, on June 29, 2010.

This Brief is accompanied by the fee under 37 C.F.R. § 41.20(b)(2).

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Real Party in Interest

The real party in interest in the present application is GM Global Technology Operations, Inc.; an assignment to GM Global Technology Operations, Inc. was recorded with the U.S. Patent and Trademark Office on January 13, 2009 at reel 022092, frame 0737. Previously, the inventors assigned the application to General Motors Corporation, an assignment that was recorded by the USPTO February 5, 2004 at reel 014963, frame 0881.

Related Appeals and Interferences

There are no other appeals, interferences, or judicial proceedings that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

Status of the Claims

Claims 1-5, 7, 9, 11-13, 15, 18, and 20 are pending in this Application and stand finally rejected. Claims 6, 8, 14, 16, and 19 are cancelled. This appeal is taken as to all of the rejected claims, claims 1-5, 7, 9, 11-13, 15, 18, and 20.

Status of Amendments

No amendment was filed after the final Office Action.

Summary of Claimed Subject Matter

Claims 1 and 11 are independent claims. Claims 2-5 and 7-10 are dependent on claim 1 or ultimately dependent on claim 1 through intermediate claims. Claims 12, 13, 15, 17, 18, and 20 are dependent or ultimately dependent on claim 11.

Independent claim 1

Independent claim 1 claims a fuel cell **60** (page 2, lines 1-6; Fig. 2) comprising a hydrogen flow path (from source **48** along flow line **112** in Fig. 2 (or **44** in Fig. 1) to fuel cell inlet **94** to outlet **96**) configured to pass hydrogen into communication with an anode catalyst of an MEA **8, 10** (page 2, lines 4-5; page 3, lines 19-20; page 6, lines 7-9 & 11-13; Figs. 1 & 2; page 9, lines 1-7 & line 20 to page 10, line 2), a coolant flow path (inlet line or pipe **50** communicating with coolant flow fields of bipolar plates **14, 16** to coolant outlet line **52**; also including bypass line **68**, through line **64**, radiator/fan **66**, coolant reservoir **72** connected by line **70**, pump **74** with line **76** and drain line **84** leading to coolant reservoir **72**) configured to pass coolant through the fuel cell to cool the fuel cell (page 3, lines 20-21; page 6, line 20 to page 8, line 2; Fig. 2), the coolant flow path comprising a coolant reservoir **72** (page 7, lines 5-11; Fig. 2), a first enclosure encompassing at least a part of the coolant flow path, e.g. an element in the coolant flow path, see page 7, line 19-23, or fuel cell stack enclosure **92** (page 8, line 21 to page 9, line 12; Fig. 2), a second enclosure encompassing at least a part of the hydrogen flow path, e.g. fuel cell stack enclosure **92** (page 8, line 21 to page 9, line 12; Fig. 2) or, if fuel cell stack enclosure **92** is the first enclosure, then fuel cell system enclosure **110** (page 9, line 13 to page 10, line 11), a first passive hydrogen vent **88** (page 7, line 19 to page 8, line 2; Fig. 2), or **98** (page 9, lines 9-12, Fig. 2), depending on the identity of the first enclosure and a second

hydrogen vent **98** (page 9, lines 9-12) or **108** (page 10, lines 6-11), depending on the identity of the second enclosure.

The first passive hydrogen vent **88** or **98** is configured to vent hydrogen from the first enclosure without reliance upon any electrical device or other active components to function (page 8, lines 3-14; page 9, lines 9-12) and configured to maintain the hydrogen concentration within the first enclosure below about 4 percent (page 4, lines 7-8; page 8, lines 15-17; page 9, lines 9-12). The second hydrogen vent is configured to vent hydrogen from the second enclosure (page 9, lines 9-12; page 10, lines 6-11).

Independent claim 11

Independent claim 11 provides a method of manufacturing an MEA fuel cell, comprising creating a hydrogen fuel flow path (from source **48** along flow line **112** in Fig. 2 or **44** in Fig. 1 to fuel cell inlet **94** to outlet **96**) to conduct hydrogen through the MEA fuel cell (page 2, lines 4-5; page 3, lines 19-20; page 6, lines 7-9 & 11-13; Fig. 2; page 9, lines 1-7 & line 20 to page 10, line 2), creating a coolant flow path (inlet line or pipe **50** communicating with coolant flow fields of bipolar plates **14, 16** to coolant outlet line **52**; also including bypass line **68**, through line **64**, radiator/fan **66**, coolant reservoir **72** connected by line **70**, pump **74** with line **76** and drain line **84** leading to coolant reservoir **72**) configured to pass coolant through the fuel cell to cool the fuel cell (page 3, lines 20-21; page 6, line 20 to page 8, line 2; Fig. 2), enclosing at least a part of the coolant flow path in a first enclosure (page 7, line 19-23 or fuel cell stack enclosure **92** (page 8, line 21 to page 9, line 12; Fig. 2)), providing a first passive hydrogen vent **88** (page 7, line 19 to page 8, line 2; Fig. 2), or **98 (**page 9, lines 9-12, Fig. 2), depending on the identity of the first enclosure in the first enclosure, enclosing at least a part of the hydrogen fuel

flow path in a second enclosure **92** (page 8, line 21 to page 9, line 12; Fig. 2) or, if fuel cell stack enclosure **92** is the first enclosure, then fuel cell system enclosure **110** (page 9, line 13 to page 10, line 11), and providing a second hydrogen vent **98** (page 9, lines 9-12) or **108** (page 10, lines 6-11), depending on the identity of the second enclosure, in the second enclosure.

The coolant flow path comprises a coolant reservoir **72** (page 7, lines 5-11; Fig. 2).

The first passive hydrogen vent is configured to passively maintain the level of hydrogen which leaks into the first enclosure below a concentration level of about 4 percent without reliance upon any electrical device or other active components to function (page 8, lines 3-14; page 4, lines 7-8; page 8, lines 15-17; page 9, lines 9-12).

The second enclosure captures hydrogen that leaks, directly or indirectly, from the hydrogen fuel flow path (page 9, lines 5-12; page 10, lines 6-11).

The second hydrogen vent configured to maintain the level of hydrogen which leaks into the second enclosure below a concentration level of about 4 percent (page 9, lines 10-12; page 10, lines 6-11).

Grounds of Rejection to be Reviewed on Appeal

Claims 1-5, 7, 9, 11-13, 15, 18, and 20 are rejected under 35 U.S.C. 103(a) over Genc, U.S. Patent Application Publication 2002/0160245 in view of Edlund, U.S. Patent Application Publication 2002/0114984 and Pettit, U.S. Patent Application Publication 2005/0058861.

Claims 10 and 17 are rejected under 35 U.S.C. 103(a) over Genc, U.S. Patent Application Publication 2002/0160245 in view of Edlund, U.S. Patent Application Publication 2002/0114984 and Pettit, U.S. Patent Application Publication 2005/0058861, further in view of Buzzelli, U.S. Patent 4,168,349.

Claims 1-5, 7, 9, 11-13, 15, and 18 are rejected under 35 U.S.C. 103(a) over Hobmeyr, U.S. Patent Application Publication 2005/0106438 in view of Pettit, U.S. Patent Application Publication 2005/0058861.

Claims 9 and 20 are rejected under 35 U.S.C. 103(a) over Hobmeyr, U.S. Patent Application Publication 2005/0106438 in view of Pettit, U.S. Patent Application Publication 2005/0058861 and the Edlund, U.S. Patent Application Publication 2002/0114984.

Claims 10 and 17 are rejected under 35 U.S.C. 103(a) over Hobmeyr, U.S. Patent Application Publication 2005/0106438 in view of Pettit, U.S. Patent Application Publication 2005/0058861 and Buzzelli, U.S. Patent 4,168,349.

Arguments

I. Claims 1-5, 7, 9, 11-13, 15, 18, and 20 are patentable over the combination of the Genc, Edlund, and Pettit references because (a) the Pettit reference is unavailable under 35 U.S.C. § 103(c) to support an obviousness rejection and (b), even if Pettit were properly prior art, there is no apparent reason to modify the Genc release valve as the Examiner proposed nor to modify Genc to include two enclosures each with passive hydrogen vents, which is not provided by the combined references.

The Examiner has relied on the Pettit reference, which is unavailable as prior art for the present application. The Pettit reference would only be prior art under 102(e). The Pettit application was assigned to General Motors Corporation as recorded by the USPTO on September 17, 2003 at reel/frame 014530/0378. The inventors' assignment of this application to General Motors Corporation was recorded by the USPTO February 5, 2004 at reel/frame 014963/0881. Because the Pettit application and this invention were, at the time this invention was made, owned by or subjected to an obligation of assignment to General Motors Corporation, the Pettit application is not prior art for the purposes of section 103. See 35 U.S.C. § 103(c).

Even were Pettit proper prior art, the rejection would be deficient because the Examiner's rationale to modify the Genc fuel cell system is not supported by any valid rationale.

"The Examiner has the initial burden to set forth the basis for any rejection so as to put the patent applicant on notice of the reasons why the applicant is not entitled to a patent on the claim scope that he seeks – the so-called '*prima facie* case.'" *Ex parte Frye,* No. 2009-6013, slip op. at 8 (BPAI Feb. 12, 2010) (citing *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472 (Fed. Cir. 1984) (the initial burden of proof is on the USPTO "to produce the factual basis for its rejection of an application under sections 102 and 103"). (quoting *In re Warner*, 379 F.2d 1011, 1016 (CCPA 1967)).

The Genc patent teaches venting gas from a cooling system, "mainly air [that] can be drawn into the cooling system form the outside or from a fuel cell cabinet (main enclosure

around the fuel cell) due to local negative pressures during normal operation or during a coolant drain process when the system is temporarily shut down." Para. [0004], lines 7-11. The gas causes a problem because is "adversely affects the coolant circulation and the proper functioning of heat exchangers." *Id.* lines 4-7. Release valve 30, Fig. 1, releases gas at a first pressure. Para. [0006]. Because the Genc system concerns pressure release of "mainly air" for the purpose of efficient and proper coolant circulation and heat exchange, there is no reason to modify the Genc system to achieve a particular hydrogen gas concentration in a particular enclosure.

The Genc patent teaches only preventing build up of gases that would adversely affect coolant circulation and heat exchange in the heat exchangers. The Examiner argues that one would modify the Genc system to keep it "safe" by changing the Genc release valve to attain a certain level of hydrogen, not even mentioned by Genc, instead of by using the Genc release valve for the purpose Genc teaches, to keep gas pressure "mainly air" at a level to allow efficient circulation and cooling. As such, the Examiner's statement that Genc keeps the fuel cell system "safe" with its release valve is unsupported by the evidence.

Further, the Pettit system relies on a ventilation stream "induced by operation of a compressor." There would be no reason why one beginning with Genc, and Genc's concern with the problems caused by gas in the coolant system, would pour Pettit's ventilation stream into Genc's coolant system. The Examiner's conclusion that one would modify Genc by the Pettit ventilation system according to Pettit runs contrary to the stated objectives of Genc.

Thus, the Examiner has failed to provide a reasonable rationale for modifying the Genc system as Pettit suggests by using a ventilation stream to flow through the enclosure as Pettit teaches. See Pettit, Abstract & paras. [0006]-[0014].

The Examiner commits an error of fact in asserting that either Genc or Pettit teach "reducing buildup of explosive gas such as hydrogen" or "keep[ing] hydrogen concentration low to a level that allows safe operation of the fuel cell system" or "hydrogen concentration is kept below 4% and preferably 1%" as he variously asserts on page 3 of the final Office Action. For these assertions he has relied on Pettit Figure 1 and paragraphs [0024] and [0030]-[0032]. Figure 1 does not support any of these allegations concerning explosive build up of hydrogen or hydrogen concentration or safe operation. Nor do the cited disclosure paragraphs. The first two paragraphs describe ventilation stream 41 flowing through reservoir 58 and then flowing into enclosure 40 to dilute gases in reservoir 58 and capture and dilute any hydrogen in enclosure 40. The ventilation stream 41 is discharged from enclosure 40 via outlet 42. After being discharged, it flows through hydrogen sensor 44. The second two paragraph describe what happens in hydrogen sensor 44. Any hydrogen in ventilation stream 41 is catalytically reacted on element 72. "The catalytic combustion of hydrogen also increases the temperature of catalytic combustion element 72 and of ventilation stream 41 . . . ." Para. [0031]. The temperature rise is detected and "results in various corrective actions being taken by the microprocessor." Para. [0032]. The temperature increases "vary with the percentage of hydrogen by volume within ventilation stream 40. For example, when the hydrogen comprises approximately 4% by volume of ventilation stream 41, a temperature rise of over 300° C. would occur and be readily detectable. Even at a greatly reduced hydrogen concentration of about 1% by volume of ventilation stream 41, a temperature rise of about 80° C. would occur and also be readily detectable." *Id.*

The cited passages, then, do not support any of the Examiner's above statements. Nor has he shown how the language in these cited paragraphs matches the claim language, as required by *In re Gulag,* 283 F.3d 1335, 1340 (Fed. Cir. 2002).

The Examiner turns to the Edlund publication for supposedly teaching a second enclosure with a second passive hydrogen vent. Edlund teaches housing 140 encompassing a fuel cell system. The housing 140 can be combined with an energy-consuming device 25 that can include a body 142, such as a motor vehicle. Edlund para. [0064]. Edlund does not teach putting a vent in either housing 140 or body 142. The Examiner basically relies on a rationale that if there is a body, it is obvious to put a vent in it. This, respectfully is insufficient to support an obviousness rejection. The Examiner has provided no reason why these particular elements in Edlund would be vented. Edlund is silent about any vent or any need to vent. The combination of all of the cited documents do not suggest passive hydrogen vents nor two housings, each with a passive hydrogen vent. The Examiner's speculation that Genc could be modified to have two housings, each with a passive hydrogen vent is pure hindsight analysis.

Accordingly, Appellants respectfully request that the Board reverse the rejection of claims 1-5, 7, 9, 11-13, 15, 18, and 20 for these reasons.

II. Claims 10 and 17 are patentable over the combination of the Genc, Edlund, Pettit, and Buzzelli references because combination with the Buzzelli reference does not remedy the shortcomings of the combination of Genc, Edlund, and Pettit in regard to supporting prima facie obviousness of independent claims 1 and 11.

Appellants rely on the lack of prima facie obviousness of underlying independent claims 1 and 11 as set out in section I. Accordingly, Appellants respectfully request that the Board reverse the rejection of claims 10 and 17 for these same reasons.

III. Claims 1-5, 7, 9, 11-13, 15, and 18 are patentable over the combination of the Hobmeyr and Pettit references because (a) both the Hobmeyr and the Pettit references are unavailable under 35 U.S.C. § 103(c) to support an obviousness rejection and (b) the combined references in any event fail to support prima facie obviousness because the Pettit reference does not support the Examiner's findings of fact as to its contents.

Both the Hobmeyr and the Pettit references are unavailable as prior art for the present application. Both of these references would only be prior art under 102(e). The Hobmeyr application was assigned to General Motors Corporation as recorded by the USPTO on November 19, 2003 at reel/frame 014726/0625. The Pettit application was assigned to General Motors Corporation as recorded by the USPTO on September 17, 2003 at reel/frame 014530/0378. The inventors' assignment of this application to General Motors Corporation was recorded by the USPTO February 5, 2004 at reel/frame 014963/0881. Because the Hobmeyr and Pettit applications and this invention were, at the time this invention was made, owned by or subjected to an obligation of assignment to General Motors Corporation, the Pettit application is not prior art for the purposes of section 103. See 35 U.S.C. § 103(c).

In addition, for the reasons explicated in section I, the Pettit reference does not support the Examiner's findings of fact regarding Pettit teaching keeping any particular hydrogen concentration within an enclosure.

Accordingly, Appellants respectfully request that the Board reverse the rejection of claims 1-5, 7, 9, 11-13, 15, and 18 for these reasons.

IV. Claims 9 and 20 are patentable over the combination of the Hobmeyr, Pettit, and Edlund references and claims 10 and 17 are patentable over the combination of the Hobmeyr, Pettit, and Buzzelli references for the same reasons as are underlying independent claims 1 and 11.

Appellants rely on the lack of prima facie obviousness of underlying independent claims 1 and 11 as set out in section III. Accordingly, Appellants respectfully request that the Board reverse the rejection of claims 9, 10, 17, and 20 for these reasons.

Conclusion

Appellants, therefore, respectfully request that the Board to reverse the final rejection of the claims on each ground.

Respectfully submitted,

/Anna M. Budde/
Anna M. Budde
Registration No. 35,085

June 29, 2010
Harness, Dickey & Pierce, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

Claims Appendix

Copy of the Claims Appealed

1. A fuel cell comprising:

a hydrogen flow path configured to pass hydrogen into communication with an anode catalyst of an MEA;

a coolant flow path configured to pass coolant through the fuel cell to cool the fuel cell, the coolant flow path comprising a coolant reservoir;

a first enclosure encompassing at least a part of the coolant flow path;

a first passive hydrogen vent configured to vent hydrogen from the first enclosure without reliance upon any electrical device or other active components to function and configured to maintain the hydrogen concentration within the first enclosure below about 4 percent;

a second enclosure encompassing at least a part of the hydrogen flow path; and

a second hydrogen vent configured to vent hydrogen from the second enclosure.

2. A fuel cell according to Claim 1, wherein the second enclosure surrounds a member selected from the group consisting of a fuel cell stack through which the hydrogen flow path and the coolant flow path pass and a hydrogen supply reservoir of the hydrogen flow path.

3. A fuel cell according to Claim 1, wherein the first passive hydrogen vent and the second hydrogen vent comprise a porous material selected from the group consisting of cellulose, plastic and metal.

4. A fuel cell according to Claim 1, wherein the first enclosure comprises the coolant reservoir and the first passive hydrogen vent is located within a wall of the coolant reservoir.

5. A fuel cell according to Claim 4, wherein the first passive hydrogen vent is further configured to substantially prevent the coolant from passing through the vent.

7. A fuel cell according to Claim 1, wherein the first passive hydrogen vent and the second hydrogen vent are configured to maintain a hydrogen concentration within the enclosure below about 1 percent without reliance upon any electrical device.

9. A fuel cell according to Claim 1, further comprising a third enclosure that encompasses at least one of the first enclosure and the second enclosure, the third enclosure having a third hydrogen vent.

10. A fuel cell according to Claim 1, wherein the first passive hydrogen vent and the second hydrogen vent are further configured to prevent a flame front from passing through the vent.

11. A method of manufacturing an MEA fuel cell, comprising:

creating a hydrogen fuel flow path to conduct hydrogen through the MEA fuel cell;

creating a coolant flow path configured to pass coolant through the fuel cell to cool the fuel cell, the coolant flow path comprising a coolant reservoir;

enclosing at least a part of the coolant flow path in a first enclosure;

providing a first passive hydrogen vent in the first enclosure, the first passive hydrogen vent configured to passively maintain the level of hydrogen which leaks into the first enclosure below a concentration level of about 4 percent without reliance upon any electrical device or other active components to function;

enclosing at least a part of the hydrogen fuel flow path in a second enclosure which captures hydrogen that leaks, directly or indirectly, from the hydrogen fuel flow path; and

providing a second hydrogen vent in the second enclosure, the second hydrogen vent configured to maintain the level of hydrogen which leaks into the second enclosure below a concentration level of about 4 percent.

12. A method of manufacturing a fuel cell according to Claim 11, wherein the first enclosure comprises the coolant reservoir and the first passive hydrogen vent is located within a wall of the coolant reservoir.

13. A method of manufacturing a fuel cell according to Claim 12, wherein the first passive hydrogen vent passively maintains the level of hydrogen by comprising a porous material capable of passing hydrogen therethrough and capable of substantially preventing the coolant from passing therethrough.

15. A method of manufacturing a fuel cell according to Claim 12, wherein passively maintaining the level of hydrogen further comprises passively maintaining the level of hydrogen which leaks into the enclosure below a concentration level of about 1 percent.

17. A method of manufacturing a fuel cell according to Claim 11, wherein passively maintaining the level of hydrogen further comprises selecting a porous material capable of passing hydrogen therethrough and capable of substantially preventing a flame front from passing therethrough.

18. A method of manufacturing a fuel cell according to Claim 17, wherein selecting a porous material further comprises selecting a porous material selected from the group consisting of cellulose, plastic and metal.

20. A method of manufacturing a fuel cell according to Claim 11, further comprising a third enclosure that encompasses at least one of the first enclosure and the second enclosure, the third enclosure having a third hydrogen vent.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.